

We claim:

1. In a computer simulation of a physical circuit or system including an analog or mixed signal digital-analog component, the physical circuit or system described in a hardware description language and characterized by a system of simultaneous equations, the method comprising:

representing the physical circuit or system as a system of simultaneous equations, the system of simultaneous equations including a slot for an active conditional equation and a dynamic slot target variable associated with the slot in the system of simultaneous equations;

selecting an active conditional equation at a current analog solution iteration;

assigning a value for the active conditional equation to a dynamic slot target variable at the current analog solution iteration, thereby associating the conditional equation with a slot in the system of simultaneous equations;

solving the system of simultaneous equations; and

using the solution to the system of simultaneous equations to validate the physical circuit or system.

2. A method for solving a system of simultaneous equations including one or more conditional equations, the system of simultaneous equations describing a physical circuit or system in a hardware description language, the circuit including an analog component, the method comprising:

representing the physical circuit or system as a system of simultaneous equations, the system of simultaneous equations including one or more slots for active conditional equations selected from a set of possible characteristic expressions and one or more dynamic slot target variables associated with the slots in the system of simultaneous equations;

selecting a set of active conditional equations at a current analog solution iteration;

assigning a value for each active conditional equation in the set of active conditional equations to a dynamic slot target variable at the current analog solution iteration, thereby associating the active conditional equation with a slot in the system of simultaneous equations; and

solving the system of simultaneous equations at the current analog solution iteration.

3. A method according to claim 2, the method further comprising:

selecting a second set of active conditional equations at a second current analog solution iteration;

assigning a value for each active conditional equation in the second set of active conditional equations to a dynamic slot target variable at the second current analog solution iteration, thereby associating the active conditional equation with a slot in the system of simultaneous equations; and

solving the system of simultaneous equations at the second current analog solution iteration.

4. A method according to claim 2, wherein assigning a value for each active conditional equation includes relating a system variable to each active conditional equation for the current analog solution iteration.

5. A method according to claim 4, wherein solving the system of simultaneous equations includes determining a value for each system variable related to an active conditional equation.

6. A method according to claim 2, wherein at most one conditional equation is assigned to each dynamic slot target variable at the current analog solution iteration.

7. A method according to claim 2, wherein each conditional equation is assigned to at most one dynamic slot target variable at the current analog solution iteration.

8. A method according to claim 2, wherein the number of active conditional equations is required to be equal to the number of dynamic slot target variables.

9. A method according to claim 8, the method further comprising reporting a simulation failure if the number of active conditional equations differs from the number of dynamic slot target variables while attempting to solve the system of simultaneous equations.

10. A method according to claim 2, wherein selecting an active conditional equation includes evaluating a condition associated with the active conditional equation.

11. A method according to claim 10, wherein evaluating a condition occurs before selecting the active conditional equation.

12. A computer-readable medium containing a program implementing a method for solving a system of simultaneous equations including one or more conditional equations, the system of simultaneous equations describing a physical circuit or system in a hardware description language, the circuit including an analog component, the program comprising:

representation software to represent the physical circuit or system as a system of simultaneous equations, the system of simultaneous equations including one or more slots for conditional equations selected from a set of possible conditional equations and one or more dynamic slot target variables associated with the slots in the system of simultaneous equations;

selection software to select a set of active conditional equations at a current analog solution iteration;

assignment software to assign a value for each active conditional equation in the set of active conditional equations to a dynamic slot target variable at the current analog solution iteration, thereby associating the active conditional equation with a slot in the system of simultaneous equations; and

solution software to solve the system of simultaneous equations at the current analog solution iteration.

13. A computer-readable medium containing a program according to claim 12, the program further comprising:

second selection software to select a second set of active conditional equations at a second current analog solution iteration;

second assignment software to assign a value for each active conditional equation in the second set of active conditional equations to a dynamic slot target variable at the second current analog solution iteration, thereby associating the active conditional equation with a slot in the system of simultaneous equations; and

second solution software to solve the system of simultaneous equations at the second current analog solution iteration.

14. A computer-readable medium containing a program according to claim 12, wherein the assignment software includes relation software to relate a system variable to each active conditional equation for the current analog solution iteration.

5 15. A computer-readable medium containing a program according to claim 14, wherein the solution software includes determination software to determine a value for each system variable related to an active conditional equation.

10 16. A computer-readable medium containing a program according to claim 12, wherein at most one conditional equation is assigned to each dynamic slot target variable at the current analog solution iteration.

15 17. A computer-readable medium containing a program according to claim 12, wherein each conditional equation is assigned to at most one dynamic slot target variable at the current analog solution iteration.

20 18. A computer-readable medium containing a program according to claim 12, wherein the number of the number of active conditional equations is required to be equal to the number of dynamic slot target variables.

25 19. A computer-readable medium containing a program according to claim 18, the program further comprising reporting software to report a simulation failure if the number of active conditional equations differs from the number of dynamic slot target variables while attempting to solve the system of simultaneous equations.

20. A computer-readable medium containing a program according to claim 12, wherein the selection software includes evaluation software to evaluate a condition associated with the active conditional equation.

30 21. A computer-readable medium containing a program according to claim 20, wherein the evaluation software is executed before the selection software.

22. An apparatus for simulating a circuit, solving a system of simultaneous equations including a conditional equation, the system of simultaneous equations describing a physical circuit or system in a hardware description language, the circuit including an analog component, the apparatus comprising:

5 a computer for simulating the physical circuit or system;

a hardware description language description of the physical circuit or system stored on a computer-readable medium;

translation software to translate the hardware description language description into a system of simultaneous equations, the system of simultaneous equations including one or

10 more slots for conditional equations selected from a set of possible conditional equations;

means for selecting a set of active conditional equations;

means for assigning a value for each active conditional equation in the set of active conditional equations to a dynamic slot target variable at the current analog solution iteration, thereby associating the active conditional equation with a slot in the system of simultaneous

15 equations; and

means for solving the system of simultaneous equations at the current analog solution iteration.

23. An apparatus according to claim 22, wherein the means for selecting an active  
20 conditional equation includes means for testing a condition associated with the active conditional equation.